SUSTAINING THE PROFESSIONAL IDENTITY OF BEGINNING TEACHERS IN EARLY MATHEMATICS, SCIENCE AND TECHNOLOGY TEACHING

Marié Botha

2012
SUSTAINING THE PROFESSIONAL IDENTITY OF BEGINNING TEACHERS IN EARLY MATHEMATICS, SCIENCE AND TECHNOLOGY TEACHING

by

Marié Botha

Submitted in partial fulfilment of the requirements for the degree

PHILOSOPHIAE DOCTOR
Curriculum Instruction

Department of Science, Mathematics and Technology

SUPERVISOR
Prof G.O.M. Onwu

2012
I dedicate this study to

My grandfather, Juriaan van Twisk. You came from Amsterdam in the beginning of the twentieth century as a young science teacher to teach the children of South Africa. You were recruited at a time when there was a shortage of science teachers. You inspired your children, grandchildren and other people’s children with stories and real life experiences in language, mathematics, science, music and art.

My husband Simon. You gave your time, you listened to me, you provided me with insightful remarks, ideas and you supported me during this long journey.

My daughter Sulette, a committed teacher of young children. During your first year of teaching in 2006 you made me aware of the experiences through which you had to live. Through your stories you made me wonder about the working lives of beginning teachers.

My grandson Jason Philip Smit. Through your eyes I see the future.

Above all else, I dedicate this study to all the teachers who passionately devote their lives to the teaching of young children.

‘If a child is to keep alive his inborn sense of wonder, he needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement and the mystery of the world we live in.’ Rachel Carson (1907-1994)
This study contributed to my own identity formation as a teacher educator, a researcher, and writer. The research was a long, challenging and multifaceted journey. I could not have sustained and finished this study without a group of people who supported, motivated and guided me.

I wish to express my sincere appreciation to my supervisor and mentor, Prof Gilbert Onwu, for his invaluable academic advice, insights and guidance. It was your continued support through the process and your excitement about the study that encouraged me in many ways. Thank you for your time, your patience, support and humour.

I would also like to thank my participants: the real teachers behind the characters of Bea, Riana, Lea, Gina, Jenna and Anne-Marie. This group of beginning teachers gave their time, they trusted me and they inspired me; they shared their experiences with me as they allowed me to listen to their voices and observe their practices. It was through their words and practices that I was able to make sense of and write their professional teacher identity portraits.

I would particularly like to thank Professor Max Bergman from the University of Basel for his inspirational advice, in the beginning of this study. You helped me narrow down my thoughts and focus.

And a special thanks to the Project SUSTAIN. I was fortunate to have on-going academic and funding support from the project. I would like to thank the Project SUSTAIN academic team from the different universities (South Africa, Malawi, Zambia and Norway). Heartfelt thanks to all my Project SUSTAIN friends and fellow students for their camaraderie, specially, Monde and Franci, who listened to me and encouraged me during the ups and downs of this journey.
In edition I am grateful for the financial support through the Foundation Phase EU Project and the University of Pretoria in the form of a bursary. Recognition is also due to Prof Cycil Hartell. You supported and encouraged me in many ways and so did my colleagues in the Department of Early Childhood Education.

My sincere gratitude goes to Hester van der Walt for her meticulous editing and practical advice. I express a genuine appreciation to Adrie van Dyk for the technical editing.

I would also like to thank Hilde van Lysebettens from Artevelde Hogeschool and Michel Vandenbroeck from Ghent University who introduced me to the concept of identity formation through conversations and the stories in Michel's book.

‘Wat begin als een zoektoeg naar het bekende, eindig in een ontmoeting met het vreemde en de ontdekking van de kostbaarste zeldzaamheid’ – Michel Vandenbroeck
DECLARATION OF AUTHORSHIP AND COPYRIGHT

I declare that this work titled:

SUSTAINING THE PROFESSIONAL IDENTITY OF BEGINNING TEACHERS IN EARLY MATHEMATICS, SCIENCE AND TECHNOLOGY TEACHING

is my own and that it has been written in my own words. All citations from literature have been acknowledged in-text and referenced in full.

I understand that all rights with regard to intellectual property in the work vest in the University of Pretoria who has the right to produce, distribute and/or publish the work in any manner considered fit.

My supervisor and I agree that subject to the University as owner of all intellectual property rights in this work, the approved version may be placed in the UpeTD archive with the following status:

Release the entire work immediately for worldwide access.

Signature.................................................. Date..........................................
MARIÉ BOTHA

Signature.................................................. Date..........................................
GILBERT O.M. ONWU

---oOo---
The focus of this study is on foundation phase and early childhood teachers’ professional identity formation. This study is about six beginning teachers in their first year of teaching early mathematics, science and technology (MST) in different schools and grade levels.

Early childhood settings and primary schools in South Africa have a diverse learner body that increasingly demands of beginning early childhood and foundation phase teachers to continually strive to adapt their teaching and young children’s learning to the different learning environments for effective implementation of the curriculum.

A learning identity framework was used to generate and analyse data. The learning identity framework is premised on the assumption that identity and learning are closely linked and that both are influenced by factors internal and external to the individual.

Specifically, the study sought to answer the research question of how beginning first-year early childhood and foundation phase teachers form, sustain or change their professional teacher identity in the teaching of mathematics, science and technology (MST) in the early years and in different school settings.

The study used a phenomenological approach and case study method to explain the professional teacher identity formation process and to illuminate what factors influence this process. The study researched how teacher identities can be narratively constructed on the basis of the lived experiences of the six teachers in different school contexts. Data was generated from different sources for the purpose of triangulation which included visual and written narratives, observations and interviews (open and semi-structured). The analysis and results were based on categories of descriptions of themes. The findings indicate that identity formation is an ongoing process of integration of teachers’ personal and professional histories and initial teacher education and training, alongside issues of school culture and
institutional (in-school) support. Those key factors emerge as strong determinants of the kinds and the relative stability or otherwise of professional identities which the six teachers develop in the first year of MST teaching, and thus the kind of reform-minded teachers they become.

---oOo---

KEYWORDS

Beginning teachers
Professional teacher identity
Early mathematics science and technology teaching
Teacher education programme
School contexts, foundation phase
Early childhood education
Inquiry-based approach
Identity formation

---oOo---
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DoE</td>
<td>Department of Education</td>
</tr>
<tr>
<td>ECP</td>
<td>Early Childhood Phase</td>
</tr>
<tr>
<td>FP</td>
<td>Foundation Phase</td>
</tr>
<tr>
<td>GET</td>
<td>General Education and Training in Interview</td>
</tr>
<tr>
<td>LPTI</td>
<td>Learnt professional teacher identity</td>
</tr>
<tr>
<td>MST</td>
<td>Mathematics, Science and Technology</td>
</tr>
<tr>
<td>NR</td>
<td>Narrative Reflection</td>
</tr>
<tr>
<td>O</td>
<td>Observation</td>
</tr>
<tr>
<td>OR</td>
<td>Observational Reflection</td>
</tr>
<tr>
<td>OBE</td>
<td>Outcome-Based Education</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>(R)NCS</td>
<td>Revised National Curriculum Statement</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENT

## CHAPTER ONE
**INTRODUCTION AND BACKGROUND TO THE STUDY**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>1.2 BACKGROUND TO THE STUDY</td>
<td>4</td>
</tr>
<tr>
<td>1.2.1 EARLY MATHEMATICS SCIENCE AND TECHNOLOGY CURRICULUM</td>
<td>5</td>
</tr>
<tr>
<td>1.2.1.1 Early childhood phase</td>
<td>5</td>
</tr>
<tr>
<td>1.2.1.2 Foundation phase</td>
<td>6</td>
</tr>
<tr>
<td>1.2.2 TEACHER EDUCATION PROGRAMMES</td>
<td>8</td>
</tr>
<tr>
<td>1.2.3 THE BEGINNING TEACHER AND PROFESSIONAL IDENTITY FORMATION</td>
<td>11</td>
</tr>
<tr>
<td>1.3 THE PROBLEM OF THIS STUDY</td>
<td>13</td>
</tr>
<tr>
<td>1.3.1 RESEARCH QUESTIONS</td>
<td>16</td>
</tr>
<tr>
<td>1.4 SIGNIFICANCE OF THE STUDY</td>
<td>17</td>
</tr>
<tr>
<td>1.5 PURPOSE OF THE STUDY</td>
<td>19</td>
</tr>
<tr>
<td>1.6 CLARIFICATION OF CORE CONCEPTS AND TERMINOLOGIES</td>
<td>19</td>
</tr>
<tr>
<td>1.6.1 PROFESSIONAL TEACHER IDENTITY</td>
<td>19</td>
</tr>
<tr>
<td>1.6.2 PROFESSIONAL TEACHER IDENTITY FORMATION</td>
<td>20</td>
</tr>
<tr>
<td>1.6.3 REFORM-MINDED TEACHER</td>
<td>20</td>
</tr>
<tr>
<td>1.6.4 EARLY CHILDHOOD PHASE</td>
<td>20</td>
</tr>
<tr>
<td>1.6.5 FOUNDATION PHASE</td>
<td>20</td>
</tr>
<tr>
<td>1.6.6 INQUIRY-BASED APPROACH</td>
<td>21</td>
</tr>
<tr>
<td>1.6.7 BELIEFS</td>
<td>21</td>
</tr>
<tr>
<td>1.6.8 CRITICAL REFLECTION</td>
<td>22</td>
</tr>
<tr>
<td>1.7 CHAPTER OUTLINE</td>
<td>22</td>
</tr>
</tbody>
</table>
CHAPTER TWO
LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 INTRODUCTION .............................................................................................................. 24

2.2 PROFESSIONAL TEACHER IDENTITY FORMATION .............................................. 24

2.3 TEACHER EDUCATION PROGRAMMES ...................................................................... 26

2.4 THE BEGINNING TEACHER ..................................................................................... 31

2.5 MATHEMATICS, SCIENCE AND TECHNOLOGY TEACHING ................................. 37
AT EARLY CHILDHOOD AND FOUNDATION PHASE LEVEL
2.5.1 EARLY MATHEMATICS .......................................................................................... 41
2.5.2 EARLY SCIENCE .................................................................................................. 42
2.5.3 EARLY TECHNOLOGY .......................................................................................... 43

2.6 CONCEPTUAL FRAMEWORK ................................................................................. 45
2.6.1 EXTERNAL FACTORS ............................................................................................ 47
2.6.2 INTERNAL FACTORS ........................................................................................... 48

2.7 CONCLUSION ............................................................................................................ 49
CHAPTER THREE
RESEARCH METHODOLOGY

3.1 INTRODUCTION ........................................................................................................50

3.2 RESEARCH METHODOLOGY ...................................................................................50

3.3 CASE STUDY METHOD ..............................................................................................51

3.4 SAMPLING PROCEDURE ............................................................................................52

3.5 ASSUMPTIONS OF THE STUDY ..................................................................................53

3.6 THE RESEARCH PROCESS ........................................................................................54

3.6.1 DATA COLLECTION INSTRUMENTS .....................................................................54

3.6.1.1 Photo collages ....................................................................................................55

3.6.1.2 Narrative reflection ............................................................................................56

3.6.1.3 Semi-structured individual interviews ...............................................................57

3.6.1.4 Informal observation, field notes and beginning teachers’ reflections ...............58

3.6.2 DATA COLLECTION STAGES AND DATA ANALYSIS PROCESSES: AN INTERACTIVE PROCESS .................................................................61

3.6.2.1 Photo collages ....................................................................................................64

3.6.2.2 Narrative reflection ............................................................................................64

3.6.2.3 Semi-structured interview ................................................................................65

3.6.2.4 Observation .......................................................................................................66

3.6.2.5 Observation reflection .......................................................................................67

3.6.3 DATA ANALYSIS STRATEGIES ..........................................................................68

3.6.3.1 Theme construction ..........................................................................................70
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.7</td>
<td>ETHICAL CONSIDERATIONS</td>
<td>73</td>
</tr>
<tr>
<td>3.7.1</td>
<td>INFORMED CONSENT</td>
<td>73</td>
</tr>
<tr>
<td>3.7.2</td>
<td>VOLUNTARY PARTICIPATION (CONFIDENTIALITY, ANONYMITY AND SAFETY IN PARTICIPATION)</td>
<td>74</td>
</tr>
<tr>
<td>3.7.3</td>
<td>TRUST</td>
<td>74</td>
</tr>
<tr>
<td>3.7.4</td>
<td>RISKS AND BENEFITS</td>
<td>75</td>
</tr>
<tr>
<td>3.8</td>
<td>VALIDATION OF THIS STUDY</td>
<td>75</td>
</tr>
<tr>
<td>3.9</td>
<td>CHALLENGES AND STRENGTH OF THE STUDY</td>
<td>76</td>
</tr>
<tr>
<td>3.10</td>
<td>CONCLUSION</td>
<td>78</td>
</tr>
</tbody>
</table>

---oOo---
CHAPTER FOUR
REPORTING THE RESULTS OF SIX CASES:
THE NARRATIVE PORTRAITS OF BEGINNING TEACHERS’
PROFESSIONAL TEACHER IDENTITY FORMATION IN EARLY
MATHEMATICS, SCIENCE AND TECHNOLOGY

4.1 INTRODUCTION .............................................................................................................. 79

4.2 NARRATIVE DESCRIPTIONS: SIX BEGINNING TEACHERS’ PROFESSIONAL IDENTITY PORTRAITS
4.2.1 THE CASE OF BEA ........................................................................................................... 80
4.2.2 THE CASE OF RIANA ................................................................................................... 86
4.2.3 THE CASE OF LEA ......................................................................................................... 94
4.2.4 THE CASE OF GINA .................................................................................................... 103
4.2.5 THE CASE OF JENNA .................................................................................................. 110
4.2.6 THE CASE OF ANNE-MARIE .......................................................................................... 117

4.3 SUMMARY OF IDENTITY PORTRAITS OF BEGINNING TEACHERS IN EARLY MST TEACHING AND LEARNING .................................................................................................................. 122

4.4 CONCLUDING REMARKS ................................................................................................... 126

---oOo---
CHAPTER FIVE
DISCUSSION OF RESULTS OF SIX BEGINNING TEACHERS’ PROFESSIONAL TEACHER IDENTITY FORMATION IN EARLY MST TO EXISTING LITERATURE

5.1 INTRODUCTION ......................................................................................................................... 127

5.2 FINDINGS OF THE STUDY .......................................................................................................... 127

5.2.1 PROFESSIONAL TEACHER IDENTITY FORMATION OF BEGINNING TEACHERS IN MST

5.2.1.1 Initial teacher education programme ........................................................................ 129

5.2.1.2 School context ........................................................................................................... 133

5.2.1.3 Institutional support ................................................................................................ 138

5.2.1.4 MST Curriculum interpretation and implementation .............................................. 139

5.2.1.5 Professional teacher identity .................................................................................... 152

5.2.1.6 To summarise ............................................................................................................. 153

5.2.2 FACTORS AFFECTING BEGINNING TEACHERS’ PROFESSIONAL TEACHER IDENTITY FORMATION IN EARLY MST

5.2.2.1 Internal factors that influenced beginning teachers’ professional teacher identity in early MST 154

5.2.2.2 External factors that influence beginning teachers’ professional teacher identity in early MST 157

5.3 CONCLUSION ............................................................................................................................ 164

---oOo---
CHAPTER SIX
CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION .................................................................................................................. 165

6.2 A SYNOPTIC OVERVIEW OF THE STUDY ................................................................. 165

6.3 MAIN RESEARCH QUESTION AND SUB-QUESTIONS ............................................. 166
6.3.1 MAIN RESEARCH QUESTION ................................................................................. 166
6.3.2 SUB-QUESTION ONE ................................................................................................. 169
6.3.3 SUB-QUESTION TWO ................................................................................................. 170
   6.3.3.1 External factors ........................................................................................................ 170
   6.3.3.2 MST curriculum interpretation and implementation .................................................. 171
   6.3.3.3 Internal factors ......................................................................................................... 172
6.3.4 SUB-QUESTION THREE ............................................................................................... 173

6.4 CONCLUSIONS OF THE STUDY ...................................................................................... 174
6.4.1 CONCLUSION ONE: PROFESSIONAL TEACHER IDENTITY .................................. 174
6.4.2 CONCLUSION TWO: TEACHER EDUCATION PROGRAMME .................................... 175
6.4.3 CONCLUSION THREE: MST TEACHING AND LEARNING .................................... 175
6.4.4 CONCLUSION FOUR: MST CURRICULUM .............................................................. 176
6.4.5 CONCLUSION FIVE: SCHOOL CONTEXT ................................................................. 177

6.5 RECOMMENDATIONS AND FUTURE DIRECTIONS FOR RESEARCH .................. 177
6.5.1 RECOMMENDATION ONE: PROFESSIONAL TEACHER IDENTITY FORMATION .................................................. 177
6.5.2 RECOMMENDATION TWO: TEACHER EDUCATION PROGRAMMES ....................... 178
6.5.3 RECOMMENDATION THREE: MST TEACHING AND LEARNING .............................. 178
6.5.4 RECOMMENDATION FOUR: MST CURRICULUM (POLICY) .................................... 178
6.5.5 RECOMMENDATION FIVE: SCHOOL CONTEXT ....................................................... 179
6.5.6 RECOMMENDATIONS FOR FURTHER RESEARCH ............................................... 180

6.6 FINAL THOUGHTS ............................................................................................................. 180
# REFERENCES


# APPENDICES

Appendix A  Participants letter of consent  
Appendix B  Photo collage and written narrative reflection  
Appendix C  Individual semi-structured interview schedule  
Appendix D  Gauteng Department of Education letter of consent  
Appendix E  Appendix E: Schools letter of consent  
Appendix F  Parents letter of consent  
Appendix G  Open observation schedule  

---oOo---

## LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 2.1</td>
<td>Conceptual framework (learning identity framework)</td>
<td>47</td>
</tr>
<tr>
<td>Figure 3.1</td>
<td>Examples of Bea’s photo collages in mathematics collected during stage one</td>
<td>64</td>
</tr>
<tr>
<td>Figure 3.2</td>
<td>The integrated process of data collection and data analysis</td>
<td>70</td>
</tr>
<tr>
<td>Figure 4.1</td>
<td>Bea’s classroom practice (observation and photo collages)</td>
<td>85</td>
</tr>
<tr>
<td>Figure 4.2</td>
<td>Riana’s classroom practice (observation and photo collages)</td>
<td>94</td>
</tr>
<tr>
<td>Figure 4.3</td>
<td>Lea’s classroom practice (observation and photo collages)</td>
<td>102</td>
</tr>
<tr>
<td>Figure 4.4</td>
<td>Gina’s classroom practice (observation and photo collages)</td>
<td>110</td>
</tr>
<tr>
<td>Figure 4.5</td>
<td>Jenna’s classroom practice (observation and photo collages)</td>
<td>117</td>
</tr>
<tr>
<td>Figure 4.6</td>
<td>Anne-marie’s classroom practice (observation and photo collages)</td>
<td>121</td>
</tr>
<tr>
<td>Figure 6.1</td>
<td>Operational learnt professional teacher identity (LPTI)</td>
<td>180</td>
</tr>
</tbody>
</table>

---oOo---


<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 3.1</td>
<td>Profile of participants</td>
<td>53</td>
</tr>
<tr>
<td>Table 3.2</td>
<td>Open observation schedule</td>
<td>60</td>
</tr>
<tr>
<td>Table 3.3</td>
<td>Research sequence for data collection</td>
<td>60</td>
</tr>
<tr>
<td>Table 3.4</td>
<td>The data collection stages and data analysis processes</td>
<td>63</td>
</tr>
<tr>
<td>Table 3.5</td>
<td>Observation of Bea’s lesson</td>
<td>66</td>
</tr>
<tr>
<td>Table 3.6</td>
<td>Example of statements and quotes from Bea’s case</td>
<td>71</td>
</tr>
<tr>
<td>Table 3.7</td>
<td>Data collection methods, limitations and enrichment of validation</td>
<td>77</td>
</tr>
<tr>
<td>Table 4.1</td>
<td>Summary of identity portraits of beginning teachers in Early MST teaching and learning</td>
<td>123</td>
</tr>
<tr>
<td>Table 6.1</td>
<td>External and internal factors that affected beginning teachers’ professional teacher identity</td>
<td>170</td>
</tr>
</tbody>
</table>

---ooOoo---